AMENDMENTS TO THE CLAIMS

Please amend claims as follows:

1. **(Currently amended)** A method of making a highly crystalline cross-linked polymeric material comprising:

a) heating a polymeric material to a temperature above the melt;

b) pressurizing the heated polymeric material under at least about 10-1000 MPa;

c) holding the polymeric material at this pressure **and temperature**;

d) cooling the heated polymeric material to ~~**about room**~~ **a** temperature **below the melting point of the pressurized polymeric material**;

e) releasing the pressure to an atmospheric pressure level, thereby forming a highly crystalline polymeric material; and

f) irradiating the highly crystalline polymeric material at temperature below the melt with ionizing radiation, thereby forming a highly crystalline cross-linked polymeric material.

2. **(Currently amended)** A method of making a highly crystalline cross-linked polymeric material comprising:

a) pressurizing a polymeric material under at least about 10-1000 MPa;

b) heating the pressurized polymeric material to a temperature below the melt of the pressurized polymeric material;

c) holding at this pressure and temperature;

d) cooling the heated polymeric material to ~~**about room**~~ **a** temperature **below the melting point of the polymeric material**;

e) releasing the pressure to an atmospheric pressure level, thereby forming a highly crystalline polymeric material; and

f) irradiating the highly crystalline polymeric material at temperature below the melt with ionizing radiation, thereby forming a highly crystalline cross-linked polymeric material.

3. (Original) The method of claim 1, wherein the pressurized polymeric material is heated to a temperature about 180°C or about 225°C.

4. (Original) The method of claim 2, wherein the pressurized polymeric material is heated to a temperature below 150°C.

5-6. (Cancelled).

7. **(Currently amended)** The method of claim 1 **[[or 2]]**, wherein the polymeric material is pressurized to about 320 MPa.

8. **(Currently amended)** The method of claim 1 **[[or 2]]** further comprising doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material.

9-10. (Cancelled).

11. **(Currently amended)** The method of claim 1~~, 2, 9, or 10~~ further comprising:

~~a) doping the highly crystalline cross-linked polymeric material with an antioxidant, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material;~~

[[b)]] **a)** mechanically deforming the polymeric material below its melting point; and

[[c)]] **b)** annealing the mechanically deformed polymeric material at a temperature below the melting point, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material containing substantially no detectable residual free radicals.

12. **(Currently amended)** The method of claim 1 **[[or 2]]** further comprising:

a) machining the highly crystalline cross-linked polymeric material, thereby forming a medical implant; and

b) doping the medical implant with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked medical implant.

13. **(Currently amended)** The method of claim 1 **[[or 2]]** further comprising:

a) doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material; and

b) machining the antioxidant-doped highly crystalline cross-linked polymeric material, thereby forming an antioxidant-doped highly crystalline cross-linked medical implant.

14. **(Currently amended)** The method of claim ~~11, 12, or~~ 13, wherein the antioxidant-doped highly crystalline cross-linked medical implant is packaged and sterilized by ionizing radiation or gas sterilization, thereby forming a sterile and antioxidant-doped highly crystalline cross-linked medical implant.

15-21. (Cancelled).

22. **(Currently amended)** A method of claim 1 **[[or 2]]**, wherein the polymeric material is a blend of polymer and an additive.

23. **(Currently amended)** The method of claim **63** **[[22]]**, wherein the highly crystalline cross-linked polymeric material is machined thereby forming a medical implant, this medical implant is packaged and sterilized by ionizing radiation or gas sterilization, thereby forming a sterile and antioxidant-doped highly crystalline cross-linked medical implant.

24. **(Currently amended)** A medical implant comprising the highly crystalline cross-linked polymeric material according to claim **11** ~~1, 2, 9, 10, 11, 15, or 16~~.

25. (Cancelled).

26. **(Currently amended)** The method of claim 12 **[[or 13]]**, wherein the polymeric material is compression molded to another piece or a medical implant, thereby forming an interface or an interlocked hybrid material.

27-28. (Cancelled).

29. **(Currently amended)** The method of claim 1, ~~2, 15, 16, 19, or 20~~, wherein the polymeric material is a polyolefin, a polypropylene, a polyamide, a polyether ketone, or a mixture thereof.

30. (Original) The polyolefin of claim 29 is selected from a group consisting of a low-density polyethylene, high-density polyethylene, linear low-density polyethylene, ultra-high molecular weight polyethylene (UHMWPE), or a mixture thereof.

31. (Cancelled).

32. **(Currently amended)** The method according to claim 1, ~~2, 15, 16, 19, or 20,~~ wherein the polymeric material is polymeric resin powder, polymeric flakes, polymeric particles, or the like, or a mixture thereof or an additive.

33-35. (Cancelled).

36. **(Currently amended)** The method according to claim 1, ~~2, 15, 16, 19, or 20,~~ wherein the radiation dose is between about 25 and about 1000 kGy.

37. **(Currently amended)** The method according to claim 1, ~~2, 15, 16, 19, or 20,~~ wherein the radiation dose is about 65 kGy, about 75kGy, or about 150 kGy.

38. **(Currently amended)** The method according to claim 1, ~~2, 15, 16, 19, or 20,~~ wherein the radiation is a gamma irradiation.

39. **(Currently amended)** The method according to claim 1, ~~2, 15, 16, 19, or 20,~~ wherein the radiation is an electron beam irradiation.

40-57. (Cancelled).

58. (New) The method of claim 2, wherein the polymeric material is pressurized to about 320 MPa.

59. (New) The method of claim 2 further comprising:

a) mechanically deforming the polymeric material below its melting point; and

b) annealing the mechanically deformed polymeric material at a temperature below the melting point, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material containing substantially no detectable residual free radicals.

60. (New) The method of claim 1, wherein the polymeric material is compression molded to another piece or a medical implant, thereby forming an interface or an interlocked hybrid material.

61. (New) The method of claim 2, wherein the polymeric material is compression molded to another piece or a medical implant, thereby forming an interface or an interlocked hybrid material.

62. (New) The method of claim 12, wherein the antioxidant-doped highly crystalline cross-linked medical implant is packaged and sterilized by ionizing radiation or gas sterilization, thereby forming a sterile and antioxidant-doped highly crystalline cross-linked medical implant.

63. (New) The method of claim 1 further comprising:

a) doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material; and

b) annealing the antioxidant-doped, cross-linked highly crystalline polymeric material at a temperature below the melting point of the antioxidant-doped, cross-linked highly crystalline polymeric material, thereby forming a highly crystalline cross-linked, antioxidant-doped and homogenized polymeric material.

64. (New) A medical implant comprising the highly crystalline cross-linked polymeric material according to claim 63.

65. (New) The method of claim 2 further comprising:

a) doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material; and

b) annealing the antioxidant-doped, cross-linked highly crystalline polymeric material at a temperature below the melting point of the antioxidant-doped, cross-linked highly crystalline polymeric material, thereby forming a highly crystalline cross-linked, antioxidant-doped and homogenized polymeric material.

66. (New) The method of claim 65, wherein the highly crystalline cross-linked polymeric material is machined thereby forming a medical implant, this medical implant is packaged and sterilized by ionizing radiation or gas sterilization, thereby forming a sterile and antioxidant-doped highly crystalline cross-linked medical implant.

67. (New) The method of claim 1 further comprising:

a) machining the highly crystalline cross-linked polymeric material, thereby forming a highly crystalline cross-linked medical implant;

b) doping the highly crystalline cross-linked medical implant with an additive by diffusion, thereby forming an additive-doped highly crystalline cross-linked medical implant; and

c) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped medical implant, thereby forming a additive-doped and homogenized medical implant.

68. (New) The method of claim 2 further comprising:

a) machining the highly crystalline cross-linked polymeric material, thereby forming a highly crystalline cross-linked medical implant;

b) doping the highly crystalline cross-linked medical implant with an additive by diffusion, thereby forming an additive-doped highly crystalline cross-linked medical implant; and

c) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped medical implant, thereby forming a additive-doped and homogenized medical implant.

69. (New) The method of claim 2 further comprising doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material.

70. (New) The method of claim 2 further comprising:

a) machining the highly crystalline cross-linked polymeric material, thereby forming a medical implant; and

b) doping the medical implant with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked medical implant.

71. (New) The method of claim 2 further comprising:

a) doping the highly crystalline cross-linked polymeric material with an antioxidant by diffusion, thereby forming an antioxidant-doped highly crystalline cross-linked polymeric material; and

b) machining the antioxidant-doped highly crystalline cross-linked polymeric material, thereby forming an antioxidant-doped highly crystalline cross-linked medical implant.

72. (New) The method in claim 1, wherein the polymeric material is irradiated at a temperature between about room temperature and about 90°C.

73. (New) The method in claim 2, wherein the polymeric material is irradiated at a temperature between about room temperature and about 90°C.

74. (New) The method in claim 1, wherein the polymeric material is irradiated at a temperature between about 90°C and the peak melting point of the highly crystalline polymeric material.

75. (New) The method in claim 2, wherein the polymeric material is irradiated at a temperature between about 90°C and the peak melting point of the highly crystalline polymeric material.

76. (New) The method in claim 1, wherein the polymeric material is irradiated at a temperature above the peak melting point of the highly crystalline polymeric material.

77. (New) The method in claim 2, wherein the polymeric material is irradiated at a temperature above the peak melting point of the highly crystalline polymeric material.

78. (New) The method of claim 1 further comprising:

a) doping the highly crystalline cross-linked polymeric material with an additive by diffusion, thereby forming an additive-doped highly crystalline cross-linked polymeric material;

b) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped polymeric material, thereby forming a additive-doped and homogenized polymeric material; and

c) machining the additive-doped and homogenized highly crystalline cross-linked polymeric material, thereby forming an additive-doped and homogenized highly crystalline cross-linked medical implant.

79. (New) The method of claim 2 further comprising:

a) doping the highly crystalline cross-linked polymeric material with an additive by diffusion, thereby forming an additive-doped highly crystalline cross-linked polymeric material;

b) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped polymeric material, thereby forming a additive-doped and homogenized polymeric material; and

c) machining the additive-doped and homogenized highly crystalline cross-linked polymeric material, thereby forming an additive-doped and homogenized highly crystalline cross-linked medical implant.

80. (New) A method of making highly crystalline blend of polymeric material comprising:

a) blending the polymeric material with an additive;

b) consolidating the blend;

c) heating the blend to a temperature above the melt;

d) pressurizing the blend under at least 10-1000 MPa;

e) holding at this pressure and temperature;

f) cooling the heated blend to a temperature that is below the melting point of the pressurized polymeric material; and

g) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline blend of polymeric material.

81. (New) The method of claim 80, wherein the highly crystalline blend of polymeric material is machined thereby forming a medical implant, this medical implant is

packaged and sterilized by ionizing radiation or gas sterilization, thereby forming a sterile and oxidation-resistant highly crystalline medical implant.

82. (New) A medical implant comprising the highly crystalline polymeric material according to claim 80.

83. (New) A method of making oxidation resistant highly crystalline polymeric material according to claim 80, wherein the additive is an antioxidant.

84. (New) A method of making oxidation resistant highly crystalline polymeric material according to claim 80, wherein the additive is vitamin E.

85. (New) The method in claim 80, wherein the additive concentration is between about 0.001 wt/wt% and about 50 wt/wt%.

86. (New) The method in claim 80, wherein the additive concentration is about 0.1 wt/wt%.

87. (New) A method of making a highly crystalline cross-linked polymeric material comprising:

a) irradiating a polymeric material at a temperature below or above the melt with ionizing radiation, thereby forming a cross-linked polymeric material;

b) pressurizing the cross-linked polymeric material under at least about 10-1000 MPa;

c) heating the pressurized cross-linked polymeric material to a temperature below the melt of the pressurized polymeric material;

d) holding at this pressure and temperature;

e) cooling the heated cross-linked polymeric material to a temperature that is below the melting point of the pressurized cross-linked polymeric material; and

f) releasing the pressure to an atmospheric pressure level, thereby forming a highly crystalline cross-linked polymeric material.

88. (New) A medical implant comprising the highly crystalline cross-linked polymeric material according to claim 87.

89. (New) The method of claim 87, wherein the polymeric material is compression molded to another piece or a medical implant, thereby forming an interface or an interlocked hybrid material.

90. (New) A method of making highly crystalline blend of polymeric material and additive comprising:

a) blending the polymeric material with an additive;

b) consolidating the blend;

c) irradiating the polymeric material with ionizing radiation, thereby forming a cross-linked blend of polymeric material and additive;

d) heating the cross-linked blend to a temperature above the melt;

e) pressurizing the cross-linked blend under at least 10-1000 MPa;

f) holding at this pressure and temperature;

g) cooling the heated cross-linked blend to a temperature that is below the melting point of the pressurized polymeric material; and

h) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline cross-linked blend of polymeric material and additive.

91. (New) A method of making highly crystalline blend of polymeric material and additive comprising:

a) blending the polymeric material with an additive;

b) consolidating the blend;

c) irradiating the polymeric material with ionizing radiation, thereby forming a cross-linked blend of polymeric material and additive;

d) pressurizing the cross-linked blend under at least 10-1000 MPa;

e) heating the pressurized cross-linked blend to a temperature below the melting point of the pressurized cross-linked blend;

f) holding at this pressure and temperature;

g) cooling the heated cross-linked blend to a temperature that is below the melting point of the pressurized polymeric material; and

h) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline cross-linked blend of polymeric material and additive.

92. (New) A method of making highly crystalline additive-doped polymeric material comprising:

a) doping the polymeric material with an additive by diffusion; thereby making an additive-doped polymeric material;

b) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped polymeric material, thereby forming a additive-doped and homogenized polymeric material;

c) irradiating the additive-doped and homogenized polymeric material with ionizing radiation, thereby forming a cross-linked additive-doped and homogenized polymeric material;

d) heating the cross-linked additive-doped and homogenized polymeric material to a temperature above the melt;

e) pressurizing the cross-linked additive-doped and homogenized polymeric material under at least 10-1000 MPa;

f) holding at this pressure and temperature;

g) cooling the heated cross-linked additive-doped and homogenized polymeric material to a temperature that is below the melting point of the pressurized polymeric material; and

h) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline cross-linked additive-doped and homogenized polymeric material.

93. (New) A method of making highly crystalline additive-doped polymeric material comprising:

a) doping the polymeric material with an additive by diffusion; thereby making an additive-doped polymeric material;

b) annealing the additive-doped polymeric material at a temperature below the melting point of the additive-doped polymeric material, thereby forming a additive-doped and homogenized polymeric material;

c) irradiating the additive-doped and homogenized polymeric material with ionizing radiation, thereby forming a cross-linked additive-doped and homogenized polymeric material;

d) pressurizing the cross-linked additive-doped and homogenized polymeric material under at least 10-1000 MPa;

e) heating the pressurized cross-linked additive-doped and homogenized polymeric material to a temperature below the melting point of the pressurized cross-linked additive-doped and homogenized polymeric material;

f) holding at this pressure and temperature;

g) cooling the heated cross-linked additive-doped and homogenized polymeric material to a temperature that is below the melting point of the pressurized polymeric material; and

h) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline cross-linked additive-doped and homogenized polymeric material.

94. (New) A method of making highly crystalline blend of cross-linked polymeric material comprising:

a) blending the polymeric material with an additive;

b) consolidating the blend;

c) heating the blend to a temperature above the melt;

d) pressurizing the blend under at least 10-1000 MPa;

e) holding at this pressure and temperature;

f) cooling the heated blend to a temperature that is below the melting point of the pressurized polymeric material; and

g) releasing the pressure to about an atmospheric pressure level, thereby forming a highly crystalline blend of polymeric material; and

h) irradiating the highly crystalline blend of polymeric material with ionizing radiation, thereby forming highly crystalline blend of cross-linked polymeric material.